

from λ 434 to λ 487. A spectrum of the Nova obtained on February 17, 1903, does not agree with the spectrum of the nebulosity at all.

Prof. Perrine arrives at the conclusion, from the evidence given by these spectrographs, that the results do not oppose the theory that the light of the nebulosity—as considered in that part of it called condensation D—is due to the reflection of the light emitted by the Nova at the time of its greatest brightness, although, in face of the contradictory evidence already published, he does not consider his conclusions strong enough to prove the reflection theory (Lick Observatory Bulletin, No. 33).

STELLAR PARALLAX.¹

FOR three years, from 1893 to 1896, Mr. A. S. Flint, of the Washburn Observatory, has devoted himself indefatigably to the determination of stellar parallax, and his results, contained in the eleventh volume of that observatory's publications, form a very handsome contribution to this class of inquiry. Not only are these results of great interest in themselves, but they offer a larger collection of new material than has ever been made on a single occasion. We have not only the observations of nearly a hundred stars, but all arranged and discussed on one uniform plan, a not unimportant factor in their bearing on the cosmical problem to which such results are applicable. The stars are scattered variously over the sky from the Pole to about 30° S. declination, and have been selected to include stars of considerable proper motion, a number of Prof. Burnham's double stars which show proper motion, and some twelve binary systems.

The method of observation was that suggested and employed by Prof. Kapteyn, namely, the chronographic registration of the time at which the selected star and two others, one preceding and one following, crossed the wires of the meridian instrument. The total number of observations, fairly evenly distributed between the morning and the evening, was 3659, all of which were made by Mr. Flint, while he is also responsible for the heavy work entailed in the discussion. Unfortunately, in this method of observation it is necessary to employ screens, varying in density, in front of the object glass, to reduce the light of the more brilliant star to approximately that of the stars of comparison. Experience has shown that very considerable errors are liable to be introduced in the determination of difference of R.A. when this precaution is overlooked. The ultimate value of the work will depend much on the success with which the screens are applied, and this source of error is eliminated. In this place we cannot enter fully into the devices employed or the discussion applied to the results. We can only say that the author has not found it sufficient to trust to the mechanical devices alone, but has had to submit his parallaxes to a further discussion, in order to remove systematic errors, and we can very well understand that this section of the work will be most carefully scrutinised by any astronomer who proposes to follow in the footsteps of Prof. Kapteyn or Mr. Flint.

The result of this examination is to determine a correction which the author has applied, and seeks to justify, depending on the difference of magnitude and the right ascension of the star. This correction can become so large that it might make one hesitate to apply the method in isolated instances, or wherever there is insufficient material to permit an independent inquiry. The correction which Mr. Flint applies to his parallax, or to the crude value resulting from the solution of the ordinary equations of condition, is $\frac{1}{2}$ DM. y ; where $\frac{1}{2}$ DM. is the difference between the apparent magnitude of the parallax star and the mean magnitude of the two stars of comparison, and y is given by the expression

$$y = +0''.067 + 0''.101 \cos. R.A.$$

If, then, the reduced light of the parallax star differed by one magnitude from the mean of the other two, a correction of $0''.168$ might result, and inasmuch as a difference of two magnitudes is not impossible, corrections of nearly

¹ Publications of the Washburn Observatory of the University of Wisconsin. Vol. xi. "Meridian Observations for Stellar Parallax." First Series. By Albert S. Flint, Assistant Astronomer. Pp. 435. (Madison, Wis.: State Printer, 1902.)

four-tenths may be required, and in two instances $0''.36$ is actually applied. This amount is a little startling, and though it would seem ungracious to suggest more work when so much has been attempted and carried to a successful issue, one cannot but wish that the author had made some complete sets of observations, without the use of a screen at all. Then, in the case of such a star as β Cassiopeia with its comparison stars, the amount of the correction would be some seven or eight-tenths of a second, a quantity which could not have escaped detection. To those who have not been engaged in similar inquiries it may seem strange that the error in R.A. arising from the observation of two stars of unequal magnitude is not constant, and therefore disappearing in the parallax. It may seem strange, too, that this puzzling discrepancy should vary with the time of year, for that is what the term depending on the right ascension practically means, but it must be sufficient here to refer to the volume itself, where the author has treated the matter in considerable detail, and given his figures in the clearest manner.

W. E. P.

RIDGWAY'S AMERICAN BIRDS.¹

MR. RIDGWAY is making good progress with his laborious task, the first part of this work (already noticed in these columns) having been issued in 1901. The remaining volumes (probably six in number) are in a forward state, and it is hoped may be published at the rate of two a year. The present bulky volume is devoted to four families of the Passeres, namely, the tanagers (Tanagridæ), troupials (Icteridæ), honey-creepers (Cœrebidæ), and wood-warblers (Mniotiltidæ).

The author's introductory remarks on the first of these groups afford a curious comment on the prevalent practice of dividing the Passeres into families. For the division between the tanagers and the finches (Fringillidæ) is stated to be an arbitrary one, and the former group, as now restricted, is confessedly more or less artificial. Indeed, it is suggested that the fruit-eating forms (Euphoniæ) may eventually have to be separated as a distinct family group. The author has already relegated to the Fringillidæ several of the genera included by Mr. Sclater among the Tanagridæ, while others he assigns to the Mniotiltidæ. Moreover, the possession of only nine primary quills being now regarded as an essential feature of the family, the aberrant genus *Calyptophilus* must obviously find a place elsewhere. Apart from the case of the last-mentioned genus, all this suggests that, however convenient the division into "families" of such an unwieldy group as the Passeres may be for working purposes, such divisions possess little title to be regarded as important morphological units.

In adopting the term "troupials" as the English equivalent of the family Icteridæ, the author is decidedly well advised, and it may be hoped that the practice will be adopted by future writers. In the definition of this family the author makes the general absence or slight development of the rectal bristles an important feature; but no reference to these structures is made in the main definitions of the tanagers and honey-creepers, in which they may or may not be developed. This, we think, is an omission, although we are fully aware of the importance of making definitions as concise as possible. The general plan of the "keys" appears, as in the first volume, excellent, and the plates illustrative of the beak, wing, tail, and foot-structures of the various groups described are equally satisfactory.

R. L.

A PERIODICAL OF PRECIOUS PLANTS.

UNDER the title of *Flora and Sylva*, a new monthly periodical has appeared, edited by Mr. Robinson, and devoted to the illustration and description of "precious" plants, fitted for cultivation in these islands. It is beautifully printed in large type on good paper which allows of the woodcuts being properly printed. The illustration of the palmate bamboo on p. 3 is full of life, and forms a pleasing

¹ "Birds of North and Middle America." By R. Ridgway. Part ii. (Bull. U.S. Nat. Mus., No. 50.) Pp. xx + 834; 22 plates. (1902.)

contrast to many of the blotchy "process" illustrations now so common.

The coloured illustrations are good of their kind, but it needs the patience of a Bauer to do justice to such exquisite flowers as those of the *Calochortus*, and in the present instance the artist evidently prefers effect to detail.

Mr. Nicholson's article on *Magnolias* is likely to be of permanent value, and Mr. Carl Purdy's revision of the genus *Calochortus* will be useful to those who have not ready access to the more complete monograph in the *Proceedings* of the California Academy of Sciences.

"*Sylva*" is represented by an article on the Corsican pine, concerning which so much has been written of late years. Alluding to the great variation which occurs among the pines, the author of the article says that the "wild type of a forest tree is the best, and that sports are worthless." This is a statement that appears to require some modification. In the first place, it is not easy to determine what is the wild type. If we take the Corsican tree as the type, are we to abandon as worthless the black Austrian, the Pyrenean, the Calabrian, the Pallasian, and the many other varieties of the Corsican pine? But perhaps the writer does not include these as "sports." At any rate, in their several ways they are as valuable as the form arbitrarily taken as the type.

Flora and *Sylva* promises to be a very attractive and useful addition to garden literature.

INTERACTION BETWEEN THE MENTAL AND THE MATERIAL ASPECTS OF THINGS.¹

THERE are certain ambiguous terms, to the indiscriminating use of which some misunderstandings are due. One of these is the term "science," which may be used either as synonymous with the unbiased and reverent pursuit of truth by patient and accurate methods in all departments of knowledge; or as representing the generally accepted notions of naturalists at any one epoch, together with such positive and negative tendencies and extensions into more speculative regions as may be favoured by them. The distinction between these two dissimilar things is hardly sufficiently accentuated by the use of a large or a small initial letter for the word.

Another ambiguous word is "faith," which may signify intellectual credence attached to some doctrine, in which case an emphatic and militant definite article is sometimes prefixed to it; or it may denote a moral, i.e. emotional and conative attitude to the universe in general, irrespective of intellectual cognisance of specific facts.

A third is the term "prayer," which again may represent either a submissive and devotional passive attitude of the soul in presence of a higher power, or an active and energetic petition for certain benefits or privileges, and especially for aid and guidance in crises or emergencies.

And lastly, many ambiguities, I venture to think, attach to the term "God," of which I will only mention three.

First, it may signify the highest theoretical and practical conception of men at any given epoch on this planet; a use of the term appropriate to the science of theology. Second, it may mean the Ultimate and Infinite and Absolute, concerning which no human predication is possible, and of which no even initially adequate conception can be made. Third, there are signs of its coming to be used in a limited sense by certain not unphilosophic persons—whether justifiably or not—to denote a Being, a ruler, an administrator, who is striving to evolve order out of mental and moral chaos, and to bring gradually towards perfection a race such as is competent to inhabit the surface of planets; the manager, so to speak, of the process of evolution. A being infinite in comparison to ourselves, but still a being with potentialities ahead, and with the possibility of advance, conditioned therefore to some extent by what we are conscious of as "time."

All these ambiguous terms are liable to enter into our

¹ Read to the Synthetic Society in London on February 20. The paper is supplementary to a couple of articles on "Science and Faith," by the same author, in the *Hibbert Journal* for October, 1902, and January, 1903; and it states, for the purpose of discussion, the salient arguments on which those articles were based.

present discussion, which concerns, I take it, fundamentally the intercommunion and interaction between the divine and the human, chiefly in the regions of volition and of action on the physical world. The influence of the divine on the human has been variously conceived in different ages, and various forms of difficulty have been at different times felt and suggested; but always some sort of analogy between human action and divine action has had perforce to be drawn in order to make the latter in the least intelligible to our conception. The latest form of difficulty is peculiarly deep-seated, and is a natural outcome of an age of physical science. It consists in denying the possibility of guidance or of control, not only on the part of a Deity, but on the part of every one of his creatures. It consists in pressing the laws of physics to what seems their logical and ultimate conclusion, in applying the conservation of energy without ruth or hesitation, and so excluding, as it has seemed, the possibility of free-will action, of guidance, of the self-determined action of mind or living things upon matter, altogether. The appearance of control has been considered illusory, and has been replaced by a doctrine of pure mechanism, enveloping living things as well as inorganic nature.

And those who for any reason have felt disinclined or unable to acquiesce in this exclusion of non-mechanical agencies, whether it be by reason of faith and instinct, or by reason of direct experience and sensation to the contrary, have thought it necessary of late years to seek to undermine the foundations of physics, and to show that its much-vaunted laws rest upon a hollow foundation, that their exactitude is illusory, that the conservation of energy, for instance, has been too rapid an induction, that there may be ways of eluding many physical laws and of avoiding submission to their sovereign sway.

By this sacrifice it has been thought that the eliminated guidance and control can philosophically be reintroduced.

This, I gather, may have been the chief motive of an attack on physics led by an American, J. B. Stallo, in a little book called the "Concepts of Physics," which has at various times attracted some attention. But the worst of that book was that Stallo was not really familiar with the teachings of the great physicists; he appears to have collected his information from popular writings, where the doctrines were very imperfectly laid down; so that most of the book is occupied in demolishing constructions of straw, unrecognisable by professed physicists except as caricatures at which they also might be willing to heave an occasional missile.

The armoury pressed into the service of Prof. James Ward's attack is of weightier calibre, and his criticism cannot in general be ignored as based upon inadequate acquaintance with the principles under discussion; but still his Gifford lectures raise an antithesis or antagonism between the fundamental laws of mechanics and the possibility of any intervention, whether human or divine.

If this antagonism is substantial it is serious; for natural philosophers will not be willing to concede fundamental inaccuracy or uncertainty about their recognised and long-established laws of motion, nor will they be prepared to tolerate any the least departure from the law of the conservation of energy. Hence, if guidance and control can be admitted into the scheme by no means short of refuting or modifying those laws, there may be every expectation that the attitude of scientific men will be perennially hostile to the idea of guidance or control, and so to the efficacy of prayer, and to many another practical outcome of religious belief. It becomes therefore an important question to consider whether it is true that life or mind is incompetent to disarrange or interfere with matter at all, except as an automatic part of the machine, or rather except as an ornamental appendage or dependent accessory of its working parts.

Now experience—the same kind of experience as gave us our scheme of mechanics—shows us that to all appearance live animals certainly can direct and control mechanical energies to bring about desired and preconceived results, e.g. the Forth Bridge. Undoubtedly our body is material and can act on other matter, and its energy is derived from food, like any other self-propelled and fuel-fed mechanism; the question is whether our will or mind or life can direct our body's energy along certain channels to attain desired